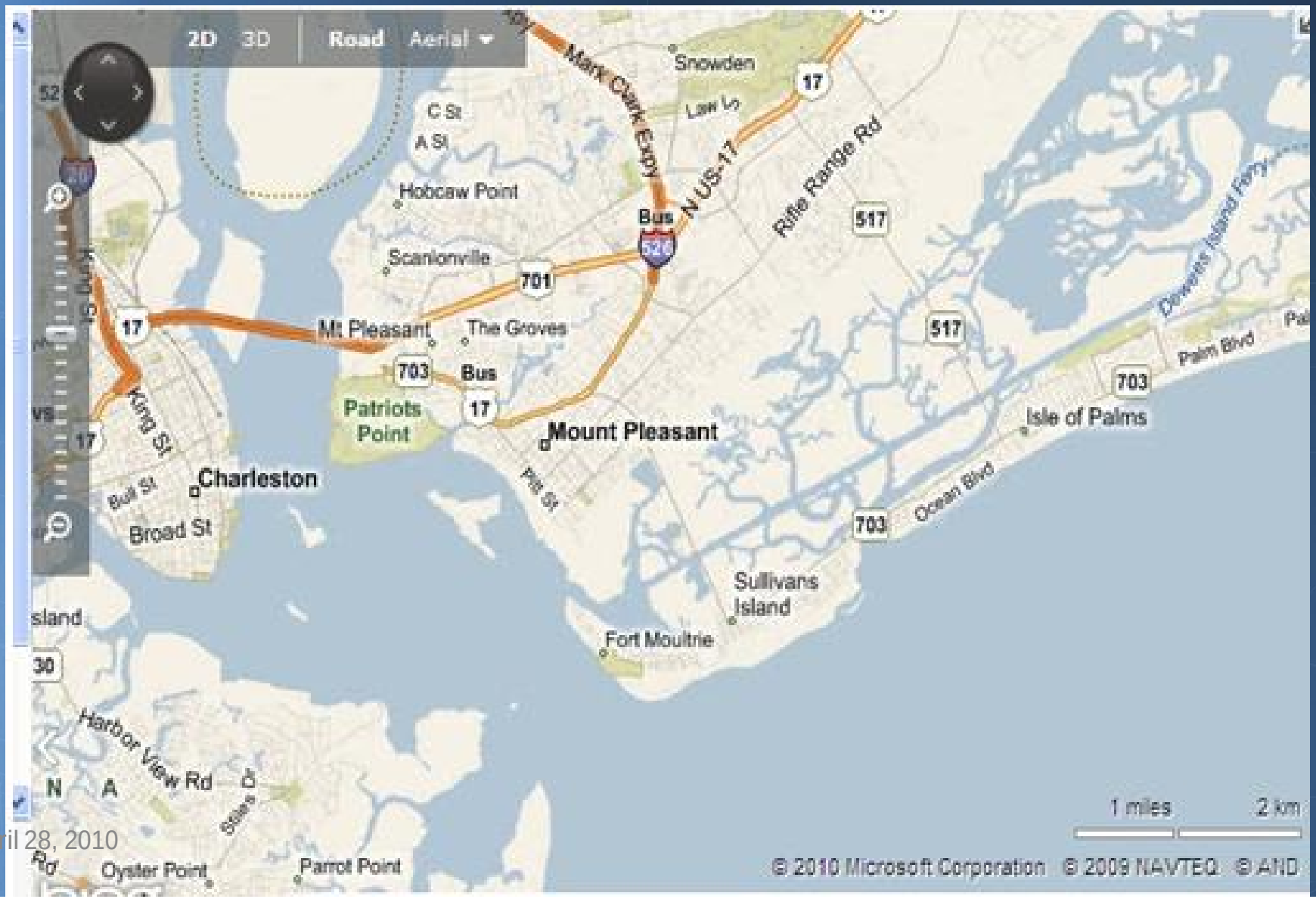
U.S. Department of Transportation
Federal Highway Administration

ACCELERATED BRIDGE CONSTRUCTION; RAISING THE BAR

ABC-PBES Technology

- Ben Sawyer Bridge, SC
- Epping Bridge, NH
- NEXT Beams
- York River Bridge, York, ME
- Rte 262/I-80 near Lincoln, NE
- UHPC
- SPMT Bridge Moves
- Folded Plate Bridges
- Mass DOT's I-93 Fast 14 Project
- Future Resources

Ben Sawyer Bridge Construction Project Location



Temporary Access & Supports

Temporary Access & Supports

Approach Spans

Swing Span

Swing Span

- Pre-assembled at fabricators shop
- Erected at Port of Charleston

- All machinery installed at erection site
- Control House erected and installed

Closure

Closure

Closure

Video – Ben Sawyer PCL-Part 1 (59 sec.)

Video – Ben Sawyer PCL-Part 2 (39 sec.)

Complete Bridge Element Prefabrication

New Hampshire Project

- *How fast can we build a bridge?*
- 115-foot span
- All components prefabricated
- Precast cantilever abutments
- Roadway open in 8 days
- Time Lapse Video on YoutubeTM

  Search “Epping Bridge Construction”

Mill Street Bridge over Lamprey River, New Hampshire – 2004

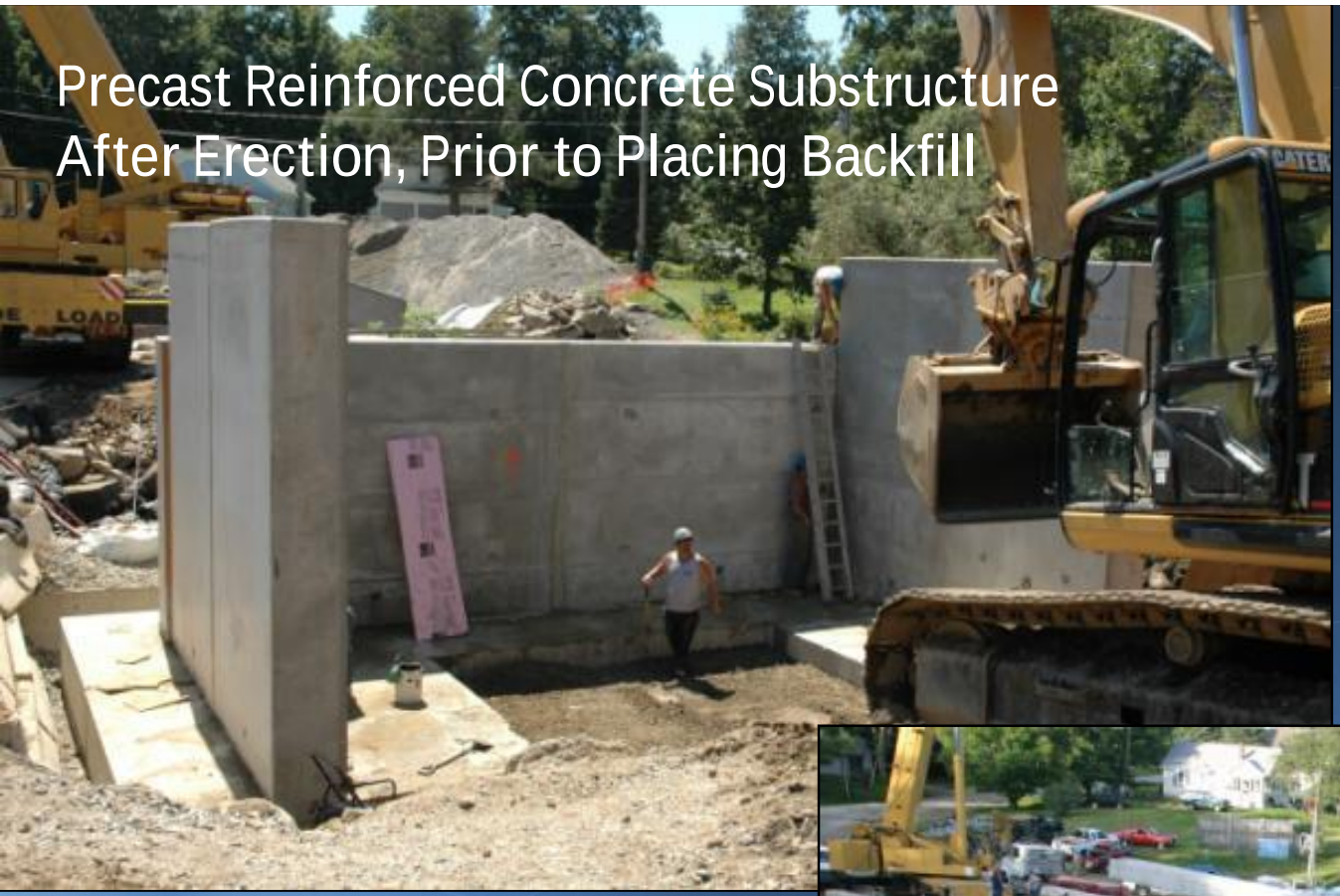

Placing Spread Footing Segments

Totally Prefabricated HPC Abutments

- 10 Footing Segments
- 11 Abutment and Wingwall Segments

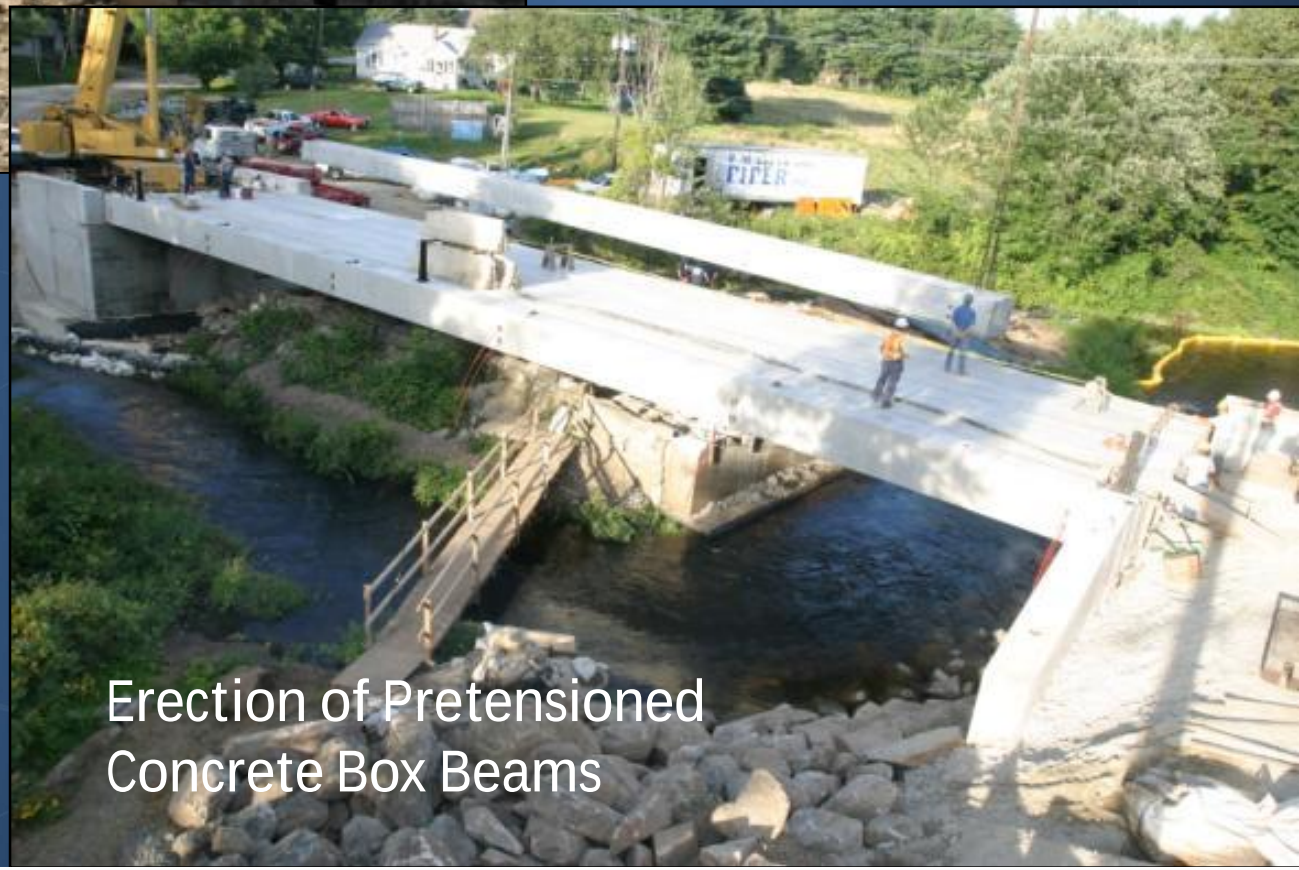

Placing Abutment Wall on Footing

Mill Street Bridge over Lamprey River – 2004



Precast Reinforced Concrete Substructure
After Erection, Prior to Placing Backfill

- 7 Pretensioned HPC Box Beams, Each 115-ft Long x 4-ft Wide x 3-ft Deep
- 4 Pilasters

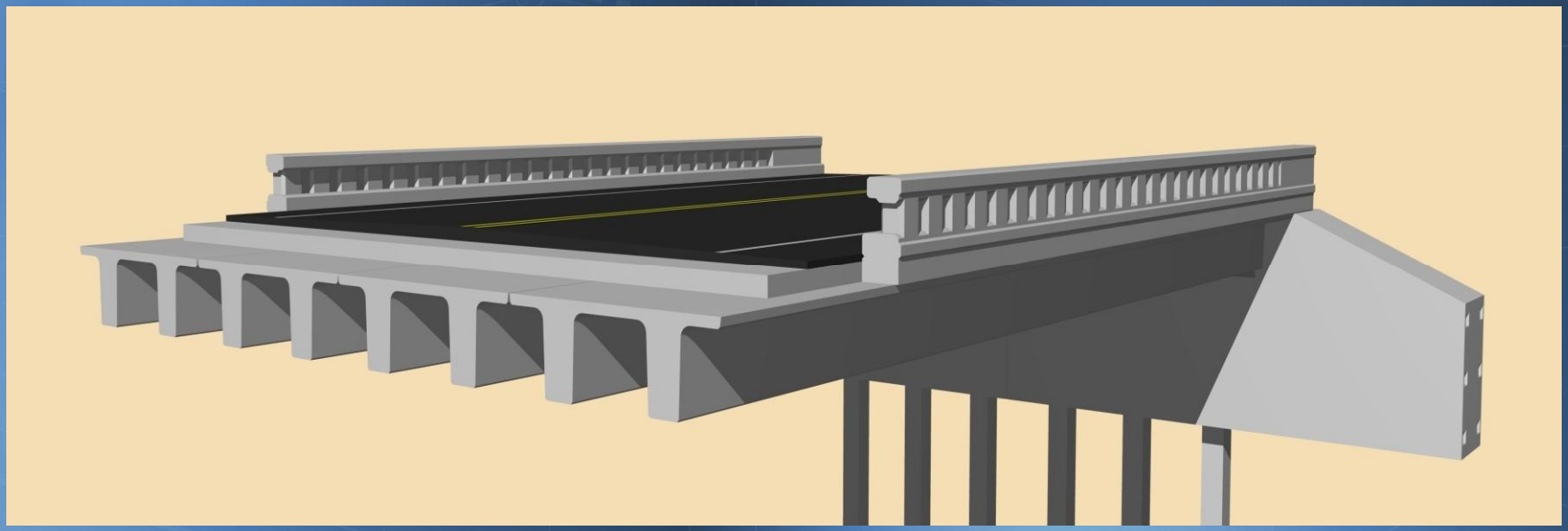


Erection of Pretensioned
Concrete Box Beams

Mill Street Bridge over Lamprey River, Epping, NH – 2004

Totally Prefabricated Bridge, Constructed in Just 8 days!

Accelerated Bridge Construction using NEXT Beams



Development of the NEXT beam

High Level RR Platform Beam

Development of the NEXT beam

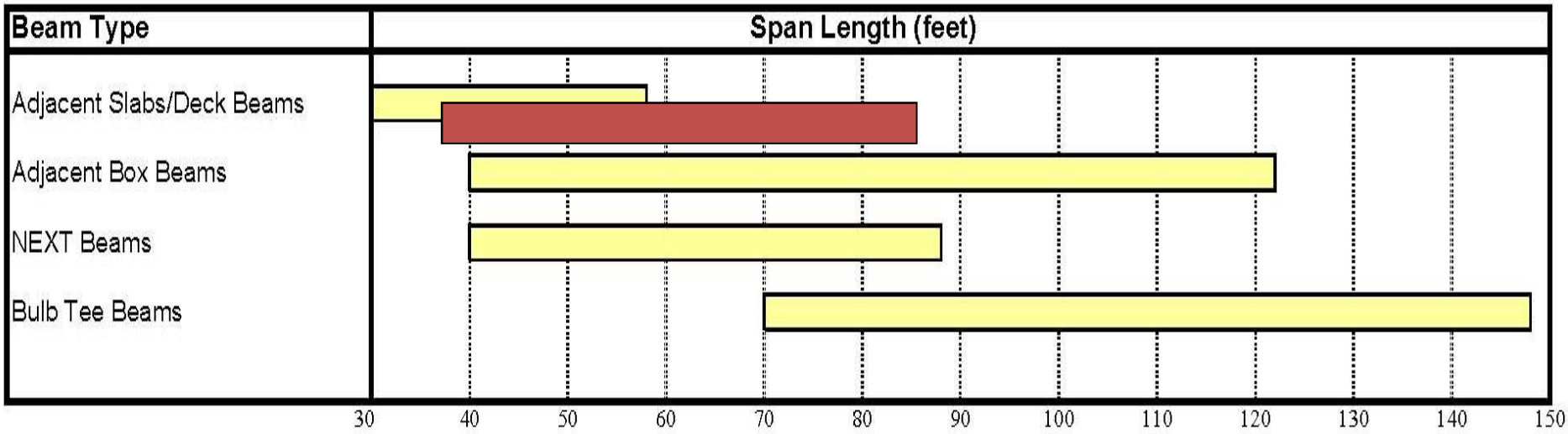
High Level RR Platform Beam

Development of the NEXT beam

Precast/Prestressed Concrete Institute Northeast Covering New England and New York

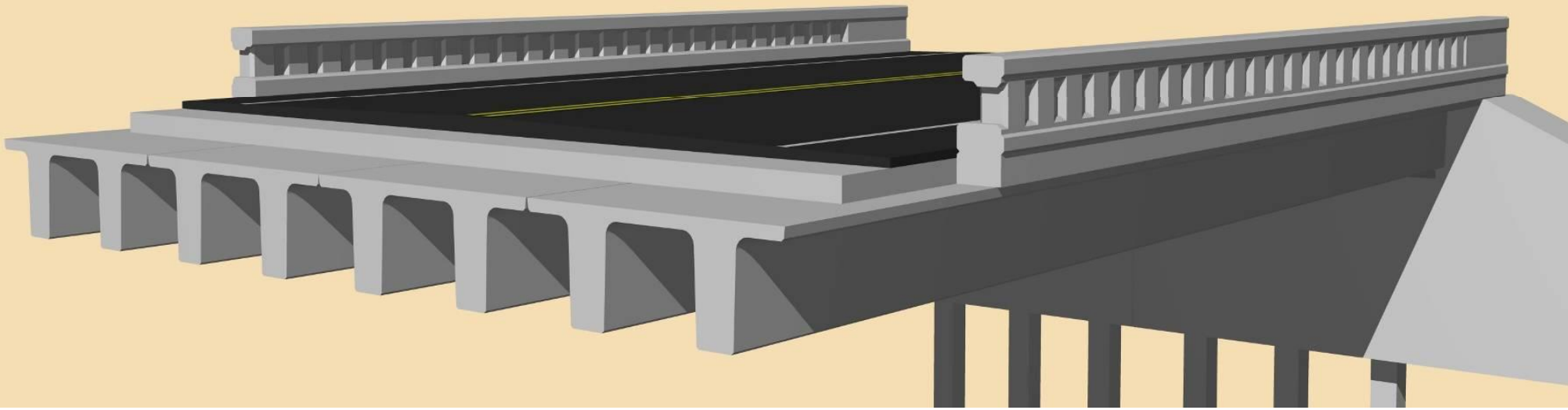
PCI

PCI Northeast Bridge Beam Sections
Common Span Ranges



Development of the NEXT F beam

4” Top Flange = Deck Form “F”
Depth 24” – 36” in 4” increments
Typical Span Range 50 – 85’
Width will vary 8’-0” – 12’-0”
Can accommodate curves (vary flange overhang on fascia)
Can accommodate multiple utilities



NEXT Beam

- Depth 24” – 36” in 4” increments
- Width Varies 8’-0” – 12’-0”
- Works Well for Accelerated Bridge Construction
- Works Well for Bridges with Utilities

York River Bridge, York, Maine

Bridge in York, Maine Involved 28 NEXT Beams

Rte 262 / I-80 near Lincoln, NE

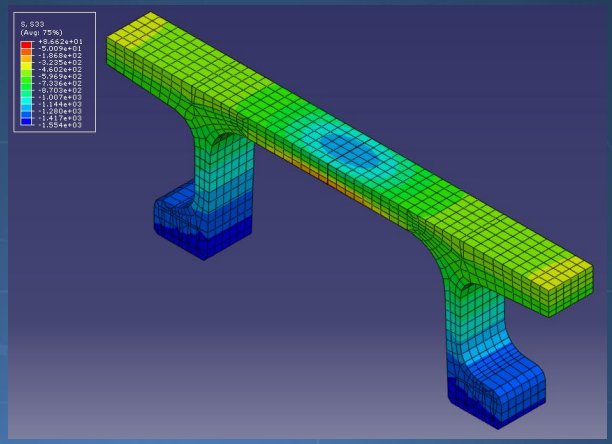
Rte 262 / I-80 near Lincoln, NE

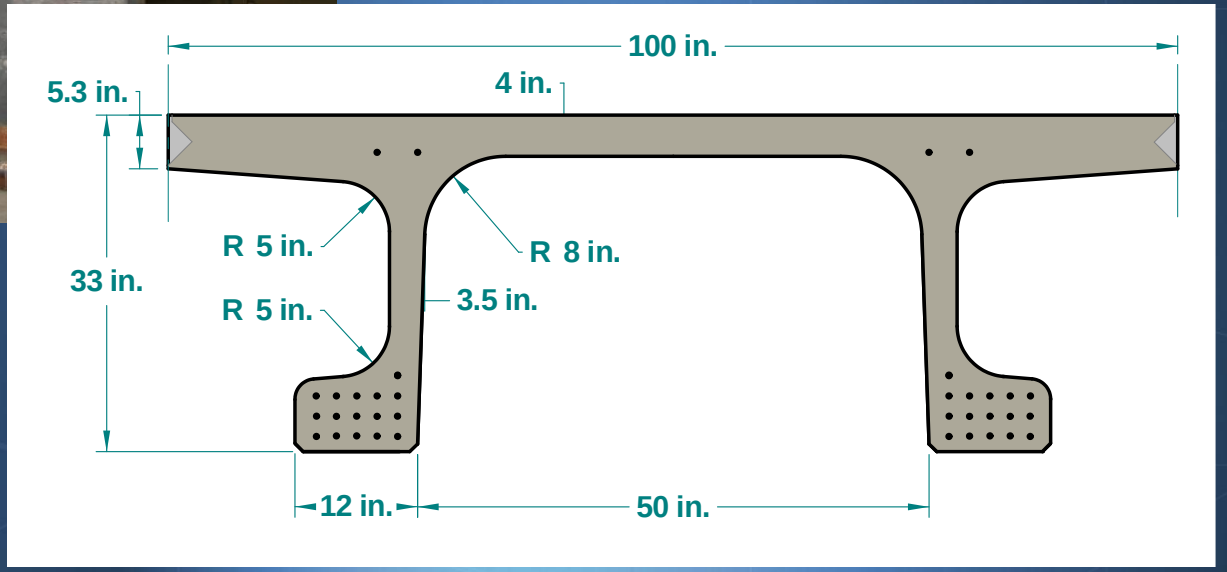
Rte 262 / I-80 near Lincoln, NE

Rte 262 / I-80 near Lincoln, NE

Rte 262 / I-80 near Lincoln, NE

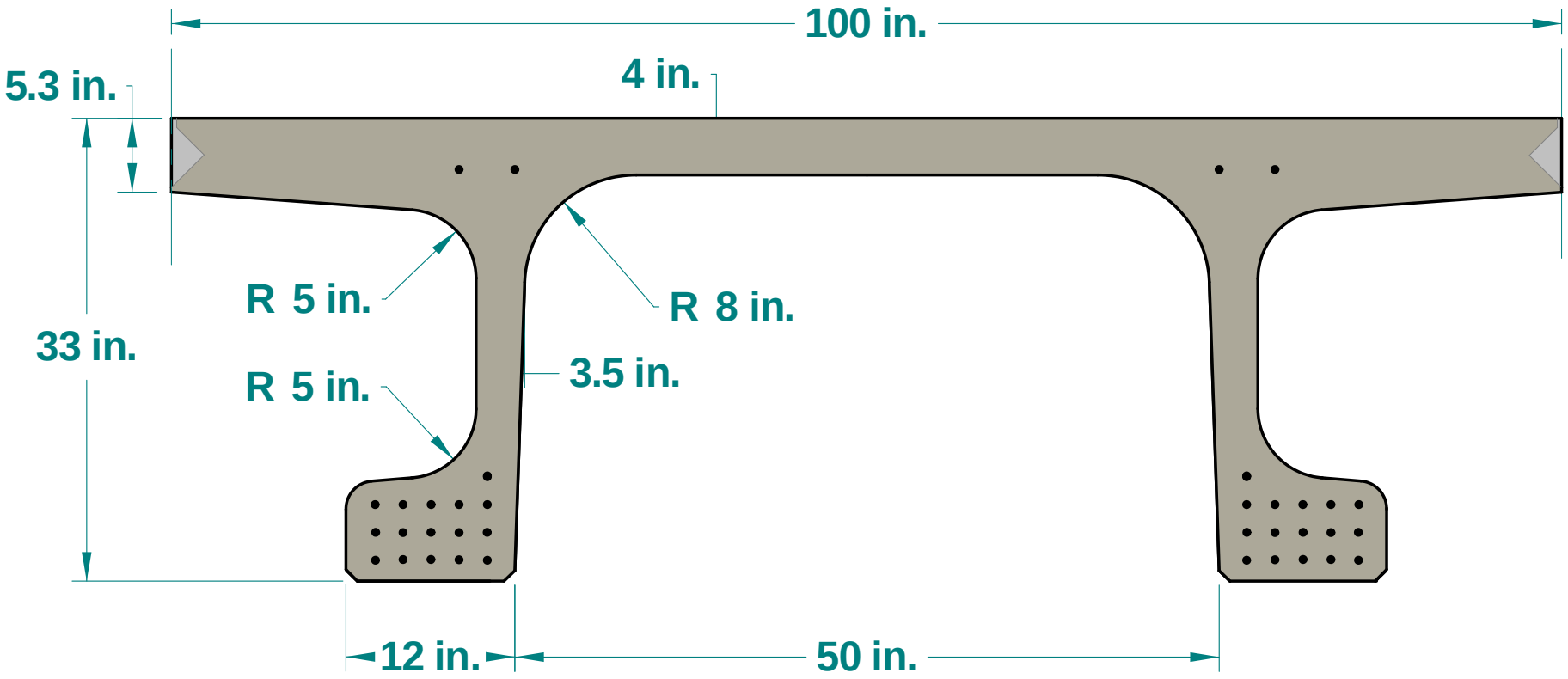
UHPC π-Girder





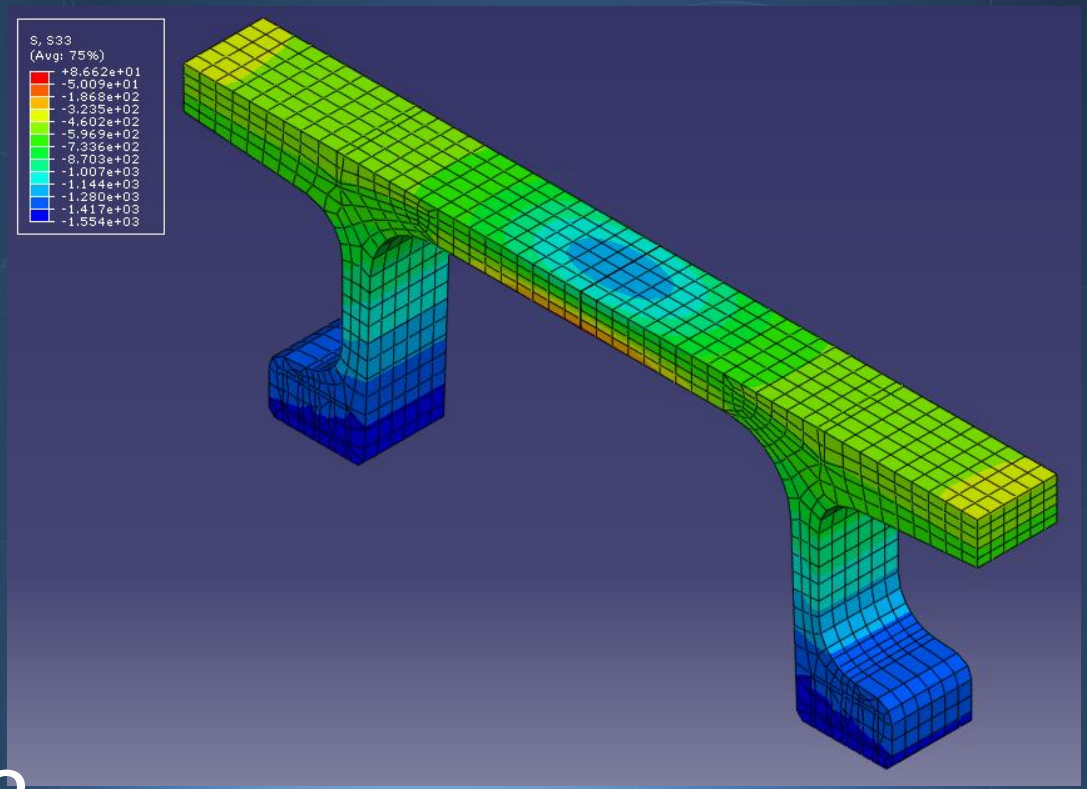

SPRINGFIELD
SPRINGFIELD

2nd Generation UHPC π-Girder



2nd Gen. π-Girder Bridge

- Designed for elastic behavior
- Transverse flexure frequently controls
- Testing at TFHRC
- Iowa DOT bridge opened in Nov. 2008



Initial Deployments of UHPC in U.S. Highway System

- Mars Hill Bridge - *Wapello County, Iowa*
  - Modified 42” deep I-girder, 110 foot simple span
  - Opened Spring 2006
- Cat Point Creek Bridge – *Richmond County, Virginia*
  - Modified 45” deep I-girder, 81 foot simple span
  - Opened in November 2008
- Jakway Park Bridge – *Buchanan County, Iowa*
  - Optimized π-girder
  - Opened in December 2008

Mars Hill Bridge
Wapello County, Iowa

U.S. UHPC Highway Bridges

Jakway Bridge
Buchanan County, Iowa

Cat Point Creek Bridge
Richmond County, Virginia

SPMT Bridge Moves

Supported at ends during build

Lifted and moved supported away from ends

SPMT Resource Providers

- Barnhart Crane & Rigging
- Bigge Crane and Rigging Co.
- Fagioli, Inc.
- Mammoet USA
- NDF (New Dafang Group)
- Sarens Group

Bridge over I-15, Pioneer Crossing, Utah

Bridge over I-15, Pioneer Crossing, Utah

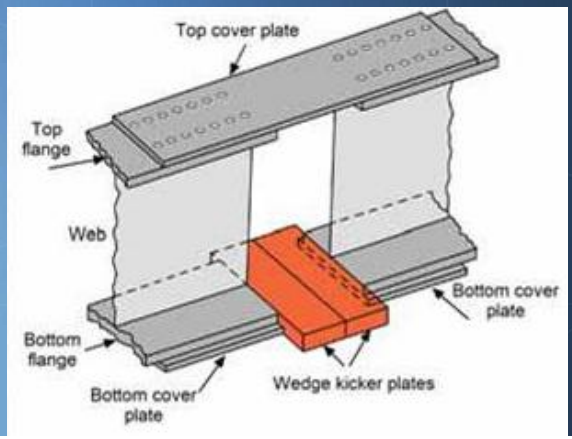
Bridge over I-15, Pioneer Crossing, Utah

Bridge over I-15, Pioneer Crossing, Utah

Bridge over I-15, Pioneer Crossing, Utah

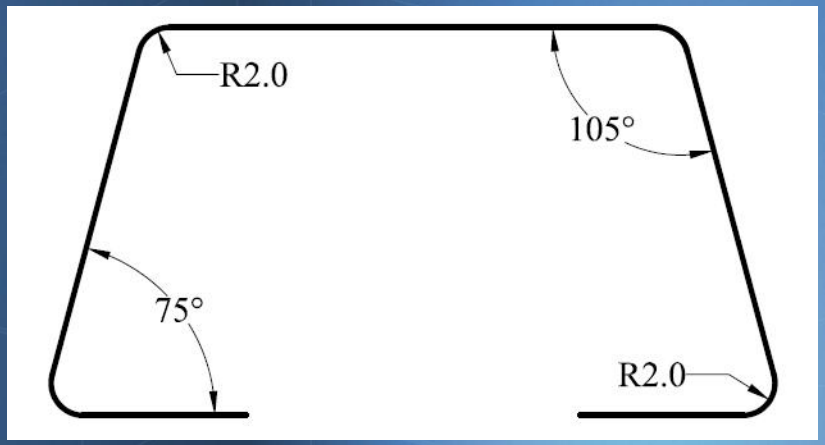
Modular Steel Stringer/Girder Systems

- Continuous spans without bolted splices
  - Simple span for DL, continuous for LL
  - Pre-topped beam units
    - single beams, double beams, box beams



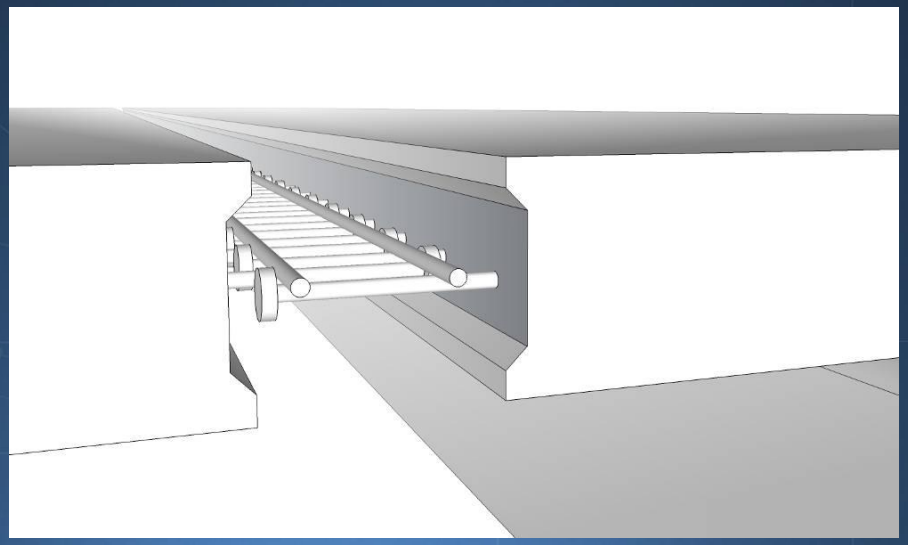
Folded Plate Bridge

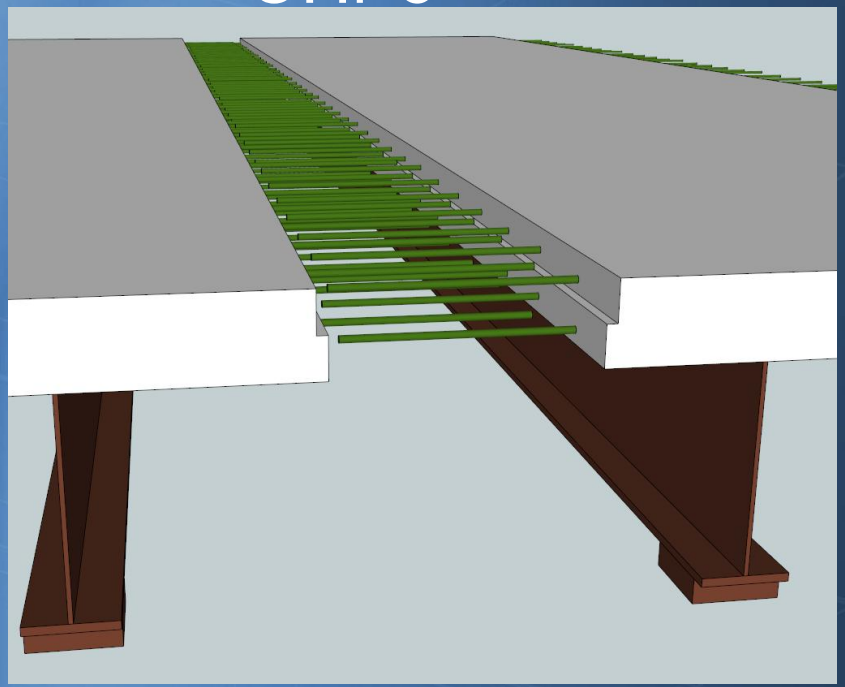
- Girder bent from single plate
- Developed by Dr. Azizinamini
- Spans up to 60 feet
- Pre-topped composite deck
- ½” or 3/8” plate thickness
- MassDOT is planning one



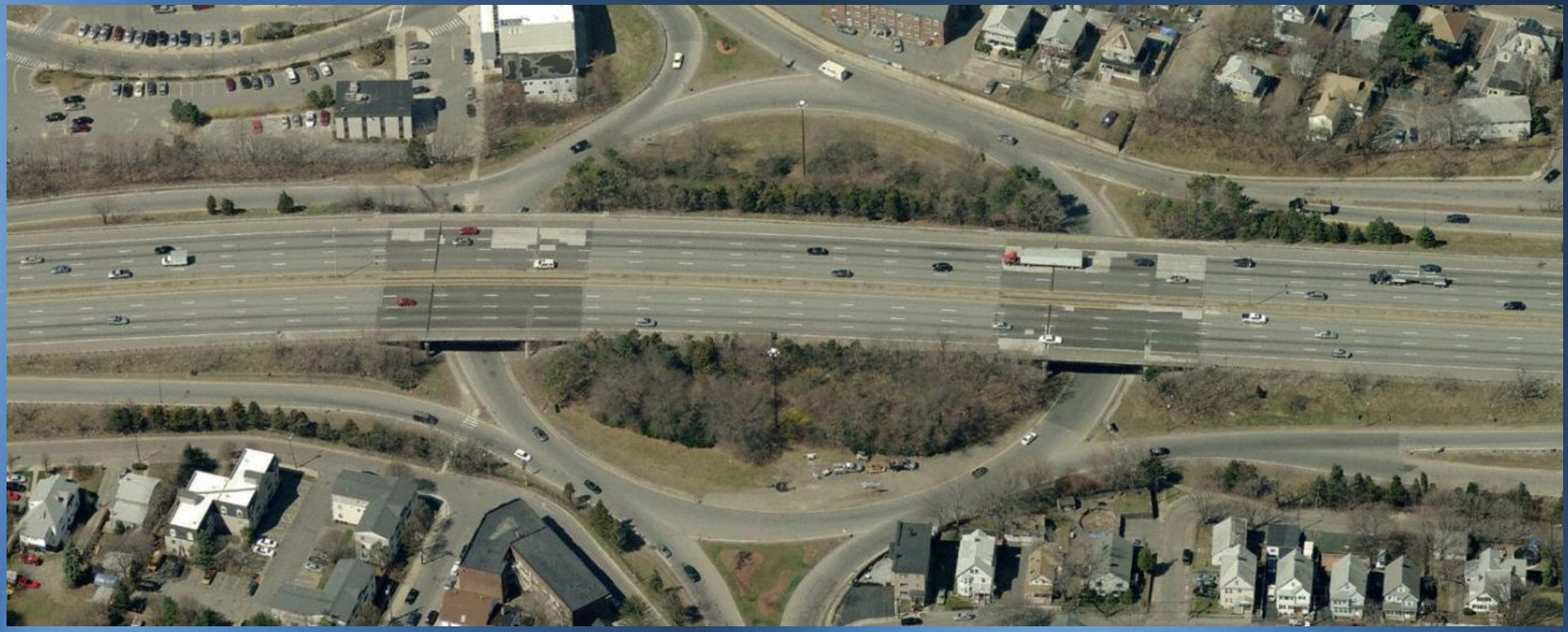
Deck Connections

- Pre-topped Modular Units
  - Deck Connection options
    - Closure Pours
    - Headed Reinforcing
    - UHPC





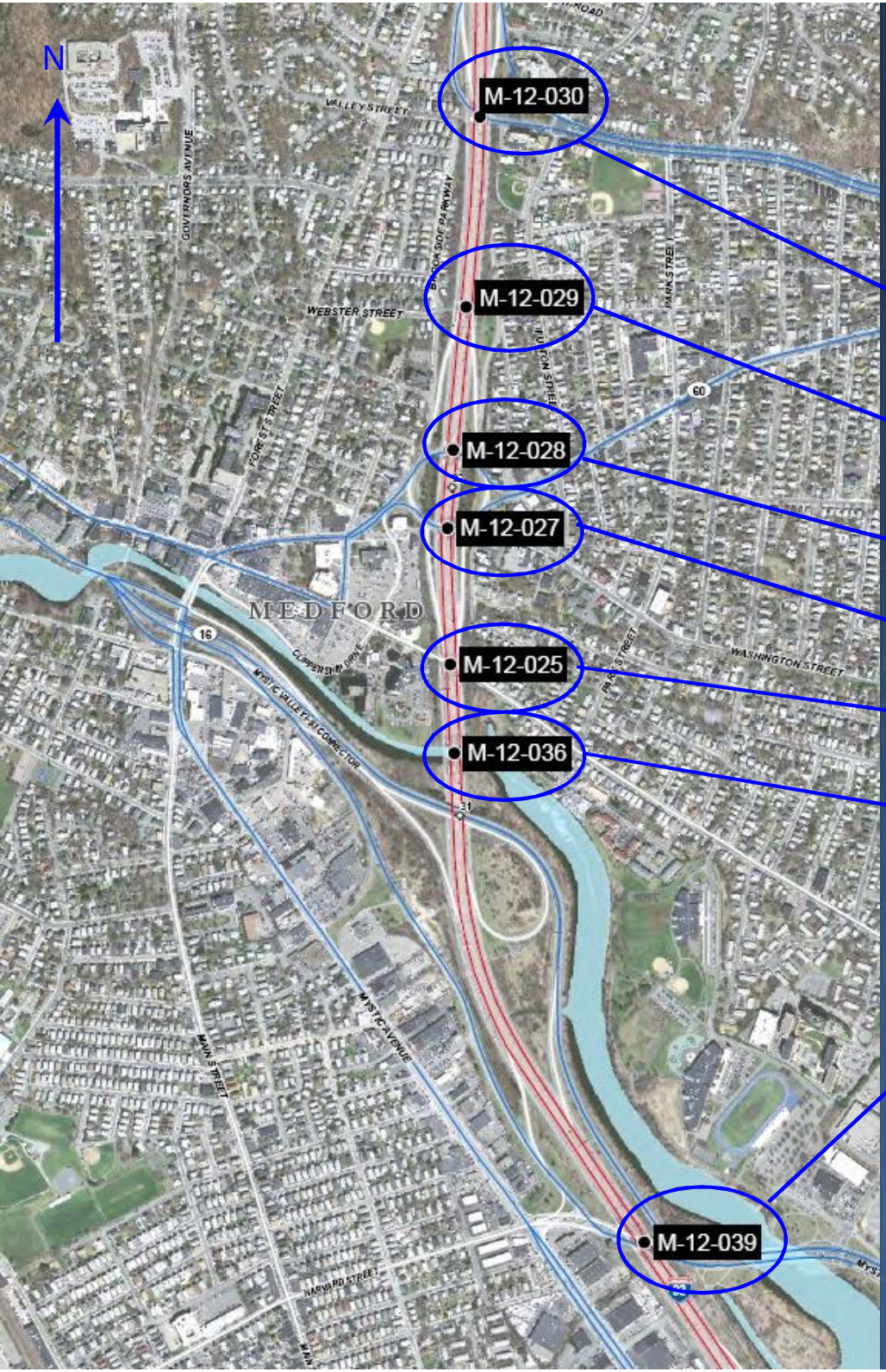
I-93 Medford, MA
Current Project



Bridge Deck/Superstructure Replacement

Project Facts

- Traffic Volume
  - Approximately 180,000 vehicles per day
- 14 Bridges (7 Northbound and 7 Southbound)
  - All have four lanes and shoulders (some ramps)
  - All bridges carry I-93 over other features
    - 1 span bridge: 1
    - 2 span bridge: 1
    - 3 span bridges: 10
    - 4 span bridges: 2



Bridge Sites

Valley Street

Webster Street

Salem Street WB

Salem Street EB

Riverside Street

Mystic River

Route 16

Project Goals

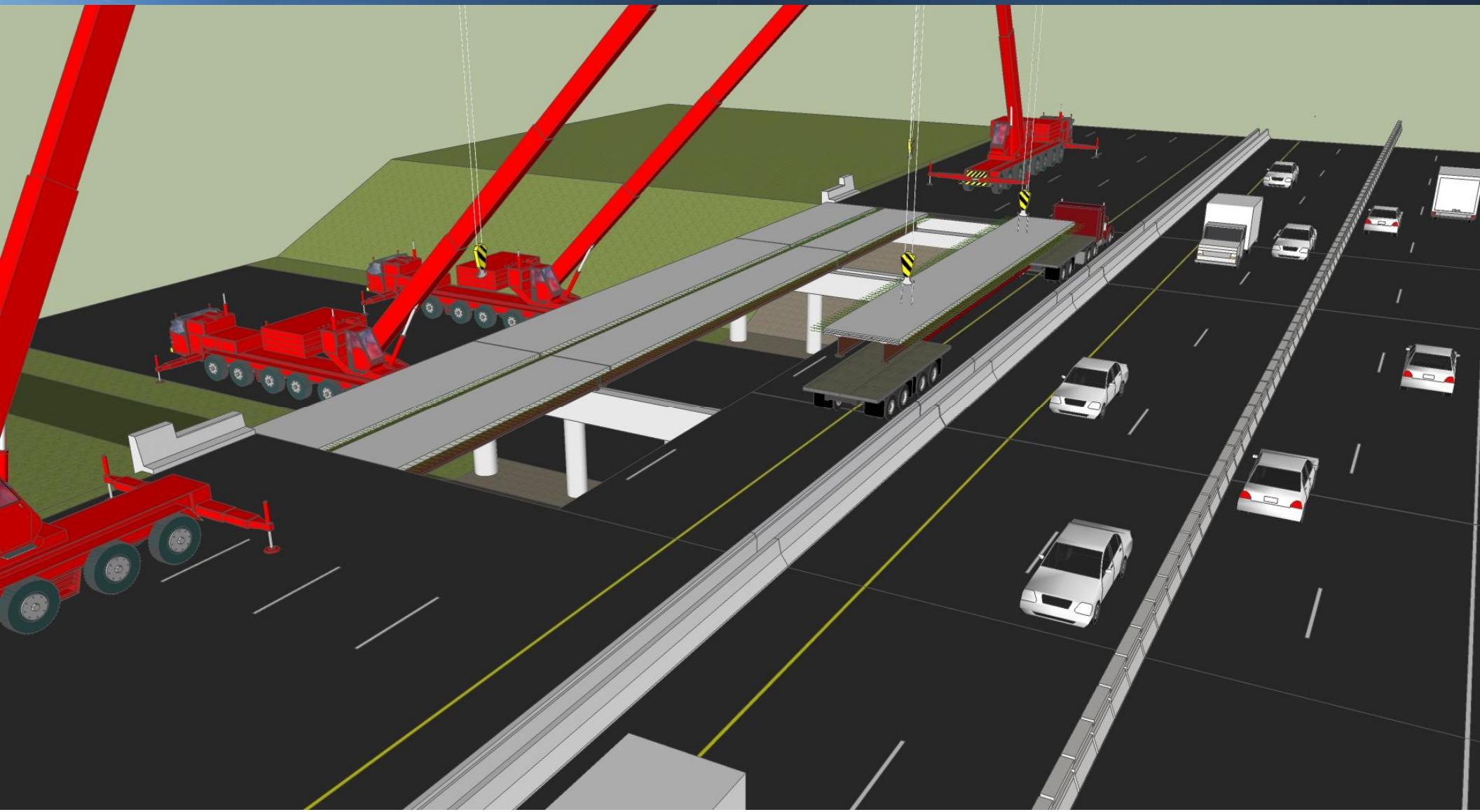
- Replace the superstructures during the summer of 2011
- Need to replace 14 bridges in 12 weeks
- Full closure on weekends – 55 hours
  - Move traffic to one side using crossovers
- No disruption to weekday rush hour traffic
- Manage weekend traffic
  - Minimize use through outreach
  - Use long-haul detours for through traffic

Previous work

- Virginia DOT
  - Richmond, VA

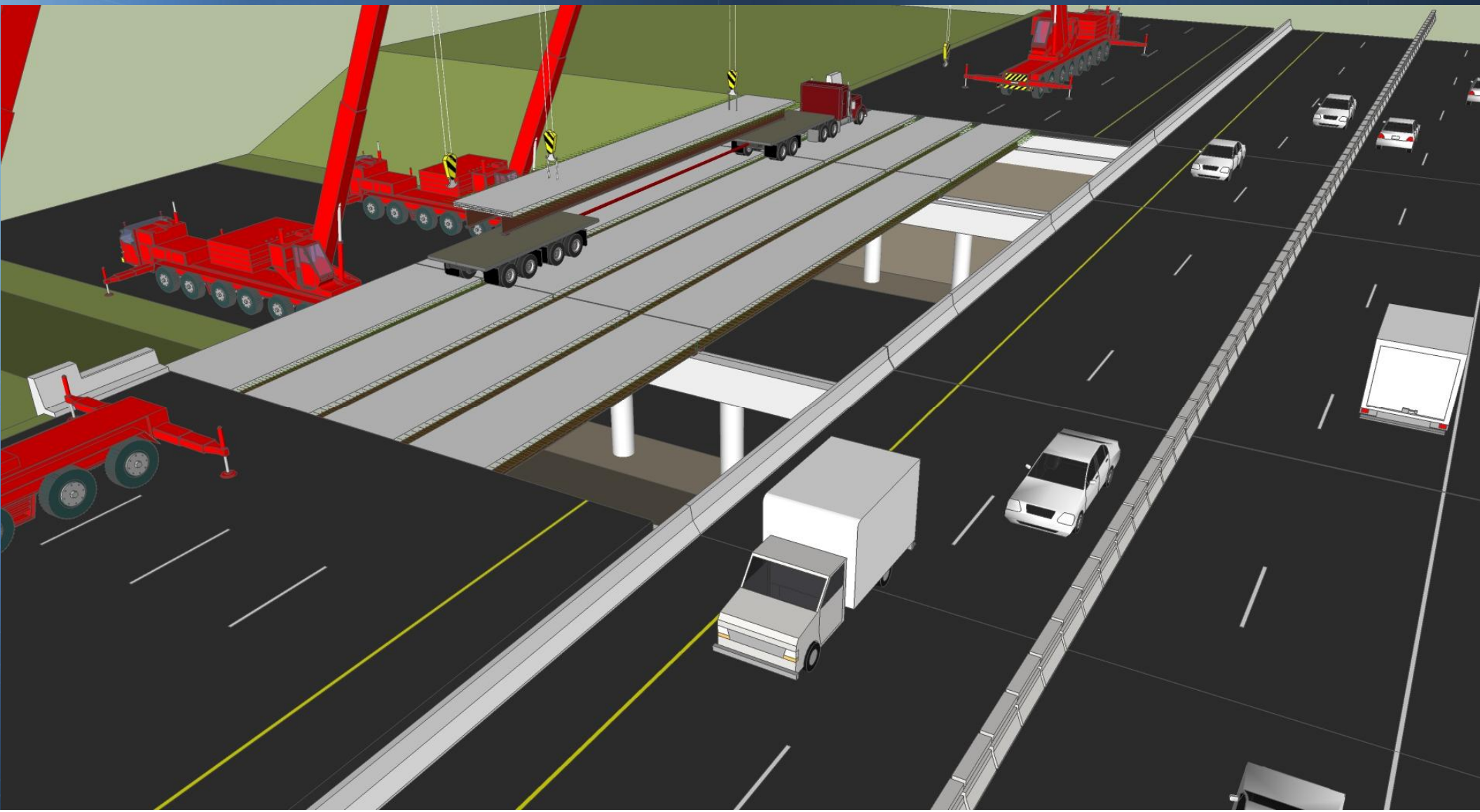
Construction Methods

Phase 1: Delivery of modules on a portion of the existing bridge



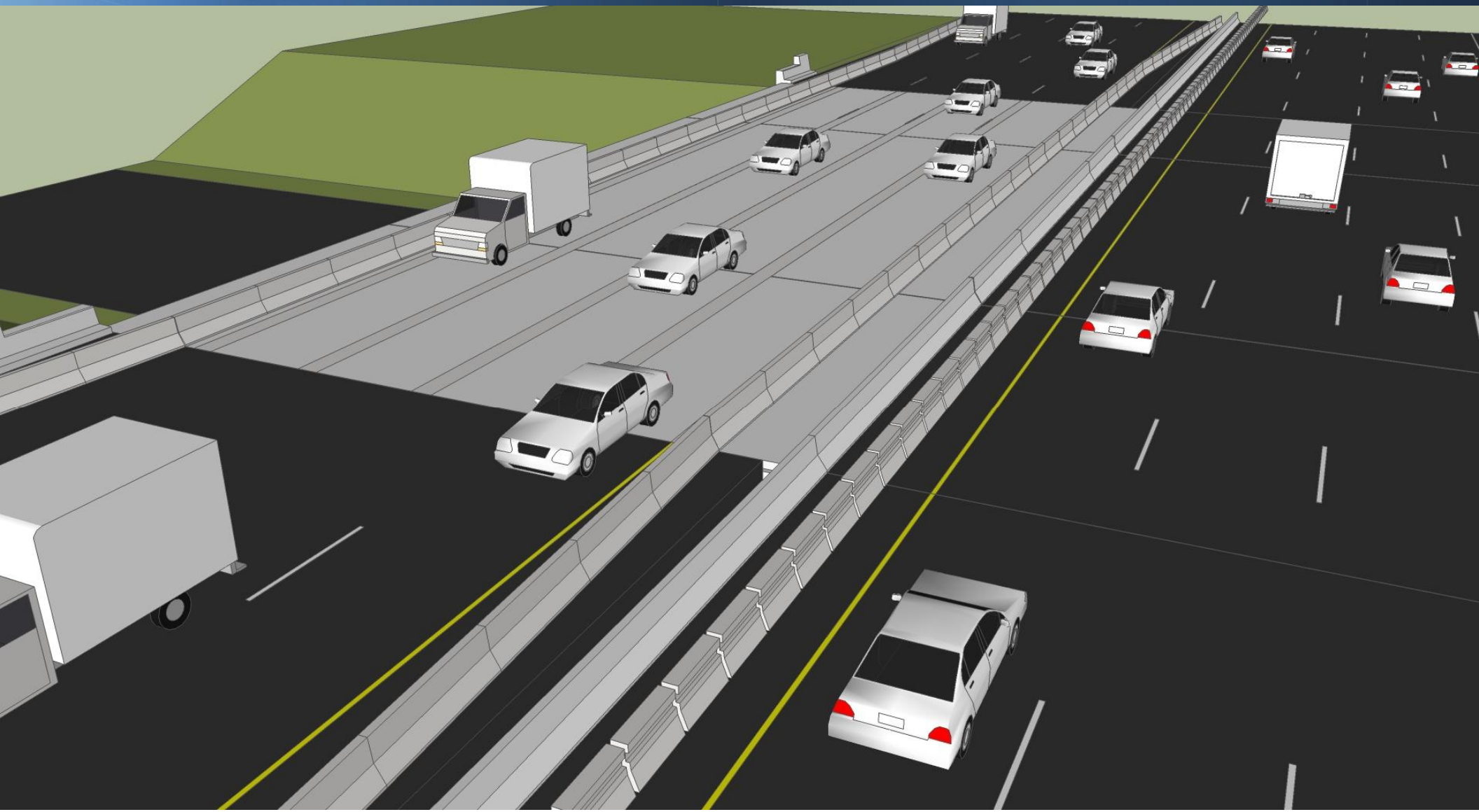
Construction Methods

Phase 2: Delivery of modules on a portion of the new bridge



Construction Methods

Monday Morning: 8 Lanes open to traffic



Project Status

- Design Build Project
  - Short listed two teams
  - Teams given stipends
  - Best Value Selection
- Bids just opened
- Notice to proceed: February 1, 2011
- First replacement: June 1, 2011

Mass DOT's I-93 Fast 14 Proj Riverside Draft Animation Video

Mass DOT Innovative Technologies

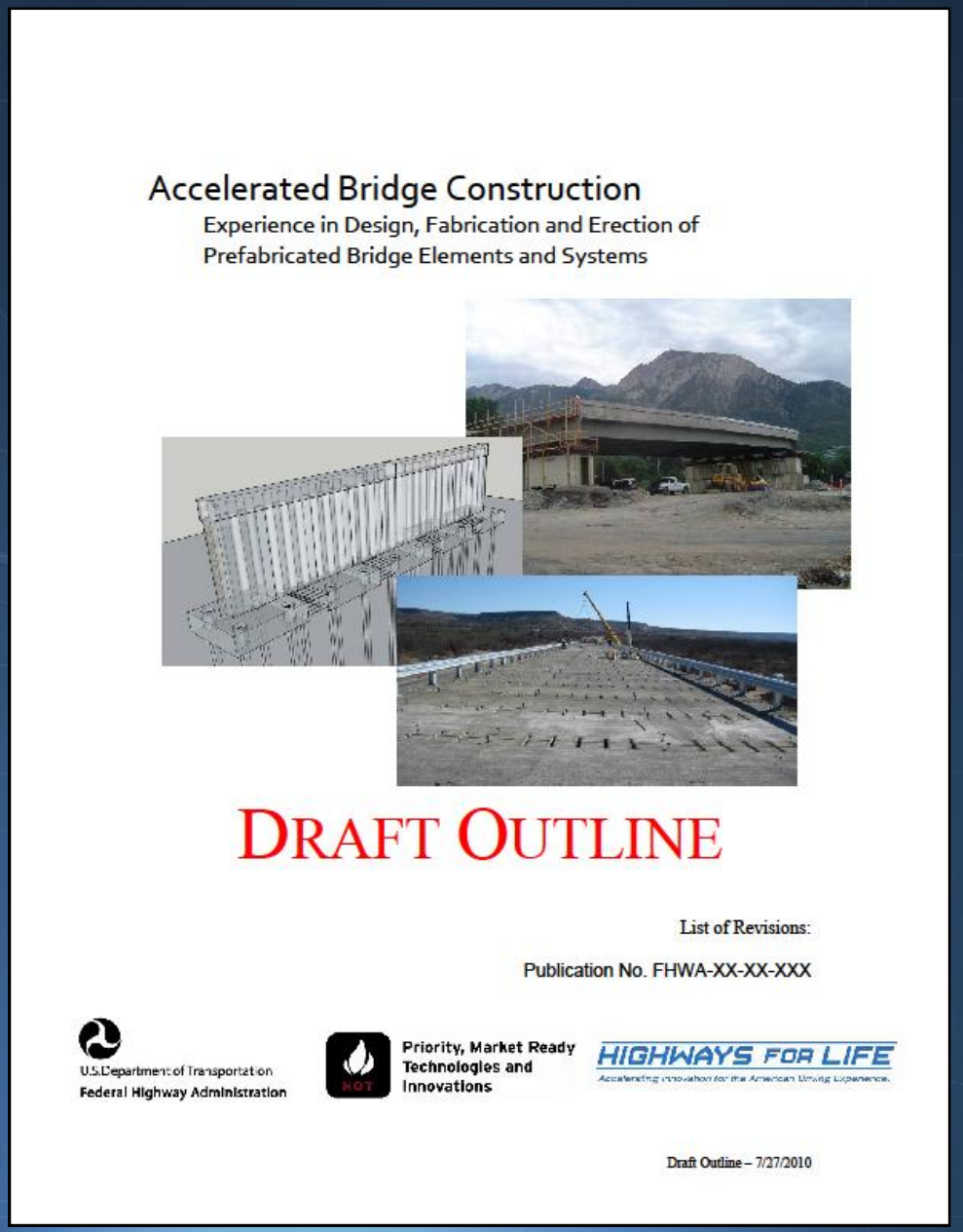
- Heavy Lifts/ABC
- New technology
  - Bridge-in-a-Backpack
  - Folded Steel Plate
  - Next Beam
  - Aluminum Deck

Take advantage of existing technologies

- Inverset
- Precast elements
- Prefabricated composite elements
- Segmental Construction
- FRP Deck

Coming Soon!
ABC Manual

- Overview of ABC techniques & practices currently in use
- App. A: Design Examples
- App. B: Standard Products
- App. C: Sample Construction Specifications
- App. D: Erection and Transportation Equipment



Coming in 2011!

SHRP2 R04 Final Report

Innovative Bridge Designs for Rapid Renewal

Objective:

To develop standardized approaches to designing, constructing & reusing (including future widening) complete bridge systems that address

rapid renewal needs and efficiently integrate modern construction equipment

Questions?

FHWA Contacts:
PBES Innovation Team

- Claude Napier, Team Lead
  claude.napier@dot.gov
- Louis Triandafilou, Structural Team Leader
  lou.triandafilou@dot.gov
- Benjamin Beerman, Structural Engineer
  Benjamin.Beerman@dot.gov

•FHWA Resource Center
Structures Technical Service Team

- Website Link
  www.fhwa.dot.gov/everydaycounts/index.cfm